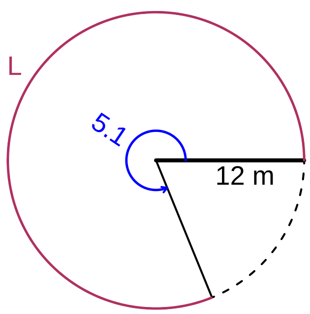
Name: Date:

Trig Final (Solution v40)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.1 radians. The radius is 12 meters. How long is the arc in meters?

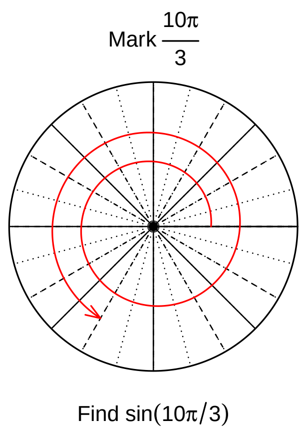


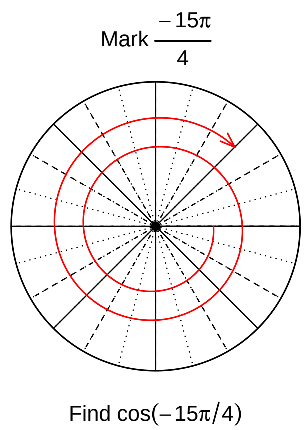
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 61.2$ meters.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{10\pi}{3}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).





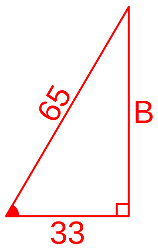
$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-33}{65}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

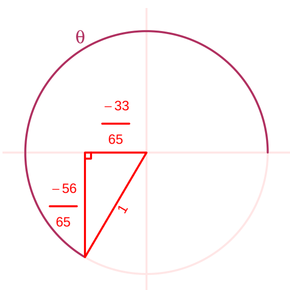
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$33^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 33^2}$$
$$B = 56$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-56}{65}}{\frac{-33}{65}} = \frac{56}{33}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.63$ meters, an amplitude of 3.69 meters, and a frequency of 7.36 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.69\sin(2\pi 7.36t) - 2.63$$

or

$$y = 3.69\sin(14.72\pi t) - 2.63$$

or

$$y = 3.69\sin(46.24t) - 2.63$$